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Caltrans Division of Research, Innovation and System Information

Research Results

Evaluating the Performance of Traffic Detection Devices

New VideoSync software tool helps assess traffic detector accuracy

Transportation Safety and Mobility

DECEMBER 2013

Project Title:
Onsite Evaluations of Roadside Devices and Operations Strategies

Task Number: 1559

Start Date: June 5, 2007

Completion Date: June 30, 2013

Product Category: New software tool

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WHAT WAS THE NEED?

Efficiently managing and operating California's highway system requires round-the-clock reliable and accurate information on traffic speed and flow. This information is derived from data collected throughout the state by vehicle detection devices, which Caltrans obtains from various vendors. However, the devices do not always perform exactly as advertised. Testing often reveals that vendors' accuracy claims are overstated or based on ideal conditions measured during the middle of the day when the devices are easiest to check manually. Under less ideal conditions, such as twilight, fog, poor weather, and traffic congestion, they might have problems with accuracy. For example, the detector might "see" vehicles that are not actually present—false positives—or not see vehicles that are—false negatives. Caltrans designs traffic facilities based on 24/7 operations, so it needs the capability to evaluate the performance of roadside vehicle detection devices in all sorts of situations to ensure that they are accurate at all times and recalibrate them as needed. For the best results, this testing should take place in the field under real-world conditions for at least a 24-hour, 7-day period of time.

WHAT WAS OUR GOAL?

The goal was to develop tools and techniques to test the round-the-clock performance and accuracy of vehicle detection devices while they are operating in the field.

Typical traffic detection device whose performance should be evaluated prior to widespread use.

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WHAT DID WE DO?

Caltrans developed the VideoSync software tool to evaluate the performance of vehicle detection devices. A simple and effective way to test a device is to capture a video of the detection zone and then compare it to the device's data output. VideoSync then takes on the challenge of synchronizing the video with the detector output to determine the accuracy of the speed, volume, occupancy, and classification data. It can process video from many sources, including existing Caltrans CCTVs, camcorders, or even smartphone cameras. The detector data can also be captured by multiple sources. VideoSync incorporates many synchronization, video, graphical, and statistical tools that are optimized to identify and help diagnose the cause of detector anomalies, such as false positives and negatives.

When VideoSync is combined with the hardware data collection capabilities of the new C1 Reader (Task ID 1546), installers can verify and validate the correct operation of a new vehicle detection station as it is being turned on for the first time. Maintenance staff can also troubleshoot and diagnose problems with existing vehicle detection stations so that they can be more quickly repaired.

WHAT WAS THE OUTCOME?

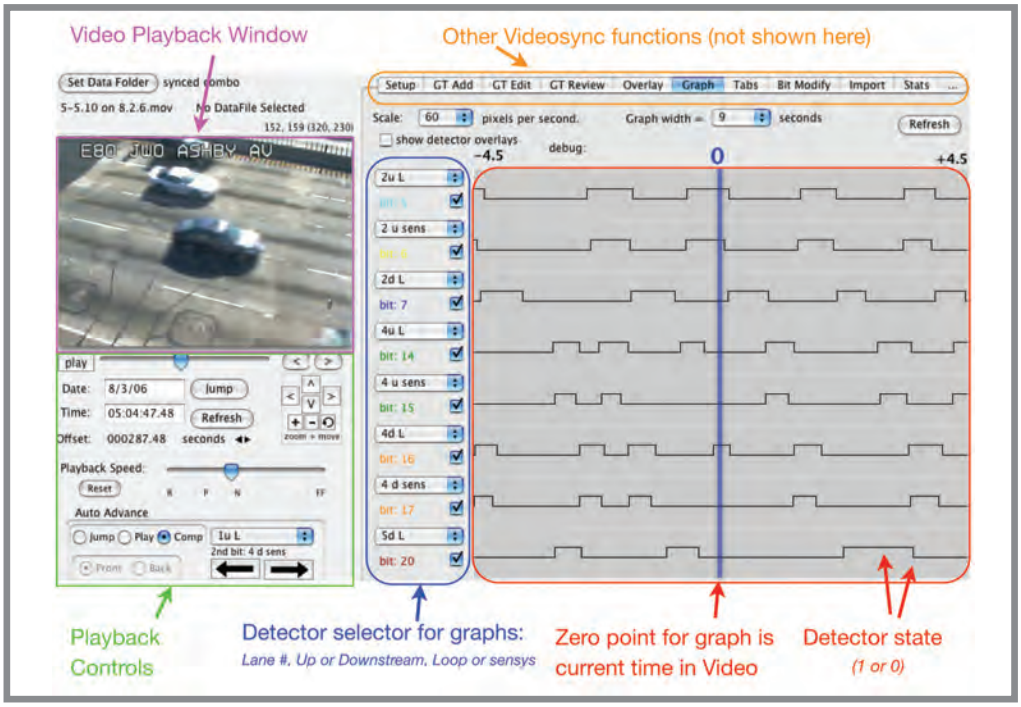
During this research project, VideoSync was used to evaluate three different vehicle detection devices in the field: the RTMS G4 side-fire radar, the Sensys Magnetometer, and the MS Sedco Bicycle Detector. All the vendors had promoted their product as ready for use with no modification. Yet all three devices failed initial, and in some cases, multiple field tests. Because VideoSync provides empirical data showing the instances where the detection faults occurred, the vendors were able to make adjustments to their products to meet Caltrans standards for use.

WHAT IS THE BENEFIT?

VideoSync helps maximize the state's investment in vehicle detection devices before purchase and installation through daily use in the field. The ability to assess a commercial product before installation puts the responsibility of improving the device on the vendor rather than Caltrans. The statewide vehicle detection system provides important data to help assess and manage roadway usage, traffic flow, and congestion. It must be reliable and accurate under all conditions. VideoSync helps ensure that the detectors are calibrated correctly by providing empirical data to diagnose and troubleshoot the problems.

LEARN MORE

To view the research:
www.dot.ca.gov/newtech/operations/videosync/index.htm



Using VideoSync to analyze a Caltrans freeway vehicle detection station